

**TP-122-01**  
**March 30, 1992**

**U.S. DEPARTMENT OF TRANSPORTATION**

**NATIONAL HIGHWAY TRAFFIC SAFETY  
ADMINISTRATION**

**LABORATORY TEST PROCEDURE**

**FOR**

**FMVSS 122**

**Motorcycle Brake Systems**



**SAFETY ASSURANCE**  
**Office of Vehicle Safety Compliance**  
**Room 6115, NSA-30**  
**400 Seventh Street, SW**  
**Washington, DC 20590**  
**OVSC LABORATORY TEST PROCEDURE NO. 122**

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## **1. PURPOSE AND APPLICATION**

The Office of Vehicle Safety Compliance (OVSC) provides contracted laboratories with Laboratory Test Procedures (TPs) which serve as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. Any contractor interpreting any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard or observing any deficiencies in a Laboratory Test Procedure is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Contractors are required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used.

The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment which will assist in procuring the required compliance test data.

### **NOTE:**

The OVSC Laboratory Test Procedures, prepared for use by independent laboratories under contract to conduct compliance tests for the OVSC, are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Sometimes, recognizing applicable test tolerances, the Test Procedures specify test conditions which are less severe than the minimum requirements of the standards themselves. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits certification tests to those described in the OVSC Laboratory Test Procedures.

## **2. GENERAL REQUIREMENTS**

Federal Motor Vehicle Safety Standard (FMVSS) No. 122, "Motorcycle Brake Systems," specifies requirements for motorcycle brake systems. The standard applies to motorcycles, motor driven cycles, and mopeds.

Each motorcycle shall meet the following requirements under the test conditions specified, when tested according to the procedures and in the sequence specified. If a motorcycle is incapable of attaining a specified speed, its service brakes shall be capable of stopping the vehicle from the multiple of 5 mph that is 4 to 8 mph less than the speed attainable in 1 mile, within stopping distances that do not exceed the stopping distances specified.

### **3. SECURITY**

The contractor shall provide appropriate security measures to protect the OVSC test vehicles from unauthorized personnel during the entire compliance testing program. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of test vehicles. Any security problems which arise shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours. The contractor shall protect and segregate the data that evolves from compliance testing before and after each vehicle test. No information concerning the vehicle safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch Chief or Division Chief.

**NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM, SHALL BE ALLOWED TO WITNESS ANY VEHICLE COMPLIANCE TEST UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.**

### **4. GOOD HOUSEKEEPING**

Contractors shall maintain the entire vehicle compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

### **5. TEST SCHEDULING AND MONITORING**

The contractor shall submit a vehicle test schedule to the COTR prior to conducting the first compliance test. Tests shall be completed as required in the contract. Scheduling shall be adjusted to permit vehicles to be tested to other FMVSSs as may be required by the OVSC. All compliance testing shall be coordinated with the COTR in order to allow monitoring by the COTR or other OVSC personnel.

### **6. TEST DATA DISPOSITION**

The contractor shall make all preliminary compliance test data available to OVSC within four hours after the test, if requested. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within 5 working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR. All backup data sheets, strip charts, recordings, plots, technician's notes etc., shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

### **7. GOVERNMENT FURNISHED PROPERTY (GFP)**

## **ACCEPTANCE OF VEHICLE**

The Contractor has the responsibility of accepting the test vehicle from either a new vehicle dealer or a vehicle transporter. In both instances, the contractor acts in the OVSC's behalf when signing an acceptance of the test vehicle. If the vehicle is delivered by a dealer, the contractor must check to verify the following:

- A. Tires are new.
- B. There are no dents or other exterior flaws.
- C. The vehicle has been properly prepared and is in running condition.
- D. The vehicle was supplied with an owner's manual, warranty document, consumer information, and an extra set of keys.

If the test vehicle is delivered by a government contracted transporter, the contractor's test engineer shall check for damage which may have occurred during transit.

A "Report Of Vehicle Condition" form (see Section 16: FORMS) will be supplied to the contractor by the COTR when the test vehicle is transferred from the new car dealer or between test contracts. The upper half of the form describes the vehicle in detail, and the lower half provides space for a detailed description of the post test condition. This form must be returned to the COTR with the copies of the Final Test Report or the reports will NOT be accepted.

## **NOTIFICATION OF COTR**

The COTR must be notified within 24 hours after a test vehicle has been delivered.

## 8. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. Guidelines for setting up and maintaining such calibration systems are described in MIL-C-45662A, "Calibration System Requirements". The calibration system shall be set up and maintained as follows:

- A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals NOT TO EXCEED TWELVE (12) MONTHS! Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.
- C. All measuring and test equipment and measuring standards will be labeled with the following information:
  - (1) Date of calibration
  - (2) Date of next scheduled calibration
  - (3) Name of the technician who calibrated the equipment
- D. A written calibration procedure shall be provided by the contractor which includes as a minimum the following information for all measurement and test equipment:
  - (1) Type of equipment, manufacturer, model number, etc.
  - (2) Measurement range
  - (3) Accuracy
  - (4) Calibration interval
  - (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
- E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before the test program commences.

## 9. PHOTOGRAPHIC DOCUMENTATION

Photographs, if required, shall be glossy black and white, 8 x 10 inches, and properly focused for clear images. One set of glossy prints will be included in the final test report which will be optically scanned by OVSC. A tag, label or placard identifying the test vehicle model, NHTSA number and date or item of equipment part number and date shall appear in each photograph and must be legible. Each photograph shall be labeled as to the subject matter.

As a minimum the following photographs shall be included in each vehicle final test report:

- A. 3/4 frontal - left side view
- B. 3/4 rear - right side view
- C. Vehicle certification label, and FMVSS 120 label if not included on certification label.
- D. Thermocouple installation of front and rear wheels
- E. Photos of test instrumentation used in conducting this test with full description: may be a composite photograph with instrumentation removed from vehicle
- F. Test instrumentation installed on vehicle
- G. Test track dimension layout (may be a scale drawing)
- H. Brake fluid reservoir labels



## **10. DEFINITIONS**

### **BRAKING INTERVAL**

The distance measured from the start of one brake application to the start of the next brake application.

### **INITIAL BRAKE TEMPERATURE**

The temperature of the hottest service brake of the vehicle 0.2 mile before any brake application.

### **SKID NUMBER**

The frictional resistance of a pavement measured in accordance with American Society for Testing and Materials (ASTM) Method E-274-70 (as revised July, 1974) at 40 mph, omitting water delivery as specified in paragraphs 7.1 and 7.2 of that method.

### **STOPPING DISTANCE**

The distance traveled by a vehicle from the start of the brake application to the point where the vehicle stops.

### **SPLIT SERVICE BRAKE SYSTEM**

A brake system consisting of two or more subsystems actuated by a single control designed so that a leakage-type failure of a pressure component in a single subsystem (except structural failure of a housing that is common to all subsystems) shall not impair the operation of the other subsystems.

### **VEHICLE WEIGHT**

Motorcycle test weight is unloaded vehicle weight plus 200 pounds (including driver and instrumentation), with the added weight distributed in the saddle or carrier if so equipped.

## **11. PRETEST REQUIREMENTS**

### **RECEIVING-INSPECTION OF TEST VEHICLE**

Complete the vehicle condition form (see Section 16: FORMS).

Upon receipt of the motorcycle, it shall be identified with a visible sign or placard showing the following information:

- A. Model year, make and model
- B. Vehicle NHTSA number (provided by COTR)
- C. FMVSS 122

Before taking each required test photo, place the sign or placard previously noted in the field of view. The sign size and location should not obstruct the test detail being highlighted in the photograph.

### **IN-HOUSE TEST PROCEDURE**

Prior to conducting any compliance test, contractors are required to submit a detailed in-house compliance test procedure to the COTR which includes a step-by-step description of the methodology to be used. Written approval must be obtained from the COTR before initiating the compliance test program so that all parties are in agreement.

### **TEST DATA LOSS**

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory Test Procedure have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters in the manner outlined in the applicable OVSC Laboratory Test Procedure may require a retest at the expense of the contractor. The retest costs will include the cost of the replacement vehicle (with the same equipment as the original vehicle) and all costs associated with conducting the retest. The original test specimen used for the invalid test shall remain the property of OVSC, and the retest specimen shall remain the property of the contractor. If there is a test failure, the contractor shall retain the retest specimen for a period not exceeding 180 days. If there is no test failure, the Contractor may dispose of the test specimen upon notification from the COTR that the final test report has been accepted. The Contracting Officer of NHTSA is the only NHTSA official authorized to notify the contractor that a retest is required. The retest shall be completed within two (2) weeks after receipt of notification by the Contracting Officer that a retest is required. If a retest is conducted, no test report is required for the original test.

## 11. PRETEST REQUIREMENTS....Continued

### TEST EQUIPMENT

The following instrumentation shall be used when testing per this procedure:

- A. Fifth wheel to measure vehicle velocity, 150 fps range with accuracy of  $\pm .7$  fps at 88 fps, maximum non-linearity of  $\pm 1.5$  fps over the range and visual output resolution of 0.15 fps.
- B. Pickup or equivalent to measure stopping distance, 2,000 ft range with accuracy of  $\pm 10$  ft in 1,000 ft, maximum non-linearity of  $\pm 20$  ft, per 2,000 ft increment, and visual output resolution of 0.1 ft.
- C. Load cells or equivalent to measure normal pedal force on foot brake pedal and hand brake lever (perpendicular to line of travel). 150 lb range with accuracy of  $\pm 1.5$  lbs at 75 lbs, maximum non-linearity of  $\pm 3$  lbs over the range, and visual output resolution of 1.5 lbs.
- D. Iron-constantan thermocouple, plug type. Maximum wire resistance variation  $\pm 10\%$  pyrometer calibrated value for non-compensated pyrometers.
- E. Friction material temperature instrumentation (pyrometer) to measure brake lining temperatures, 1,200EF range with  $\pm 10$ EF accuracy at 300EF, maximum non-linearity of  $\pm 20$ EF over the range and visual output resolution of 5EF.
- F. Decelerometer to measure vehicle deceleration rate, 1G range with  $\pm 0.5$  fpsps accuracy at 32.2 fpsps, maximum non-linearity of  $\pm 0.5$  fpsps over the range, and visual output resolution of 0.5 fpsps.
- G. Ambient temperature gauge to record ambient test temperatures, 32EF to 100EF range with  $\pm 0.5$ EF accuracy at 70EF, maximum non-linearity  $\pm 1$ EF over the range, and visual output resolution of 1EF.
- H. Stopwatch to measure elapsed time during certain tests, 15 minute range with accuracy of  $\pm 0.5$  second in 60 seconds, maximum non-linearity of 1.5 seconds over the range, and visual output resolution of 0.1 second.
- I. Anemometer to measure wind velocity 25 mph range with  $\pm 1$  mph accuracy at 15 mph, maximum non-linearity of  $\pm 2$  mph, over the range and visual output resolution of 1 mph.
- J. Continuous recorder to provide permanent, supplemental records of service brake force, parking brake force, deceleration, distance and speed versus time. Where feasible, the recorder chart shall be calibrated at the same values and with the same accuracies as the previously discussed visual

## 11. PRETEST REQUIREMENTS....Continued

output meters (to the limit of readability) with the entire instrument system connected as it is used in test vehicles. When electrical input signals to the recorder are simulated (based on data traceable to the National Institute of Standards and Technology (NIST), the accuracy of that instrument's recorded data must be verified by at least one physical check, with the entire instrument system connected as previously described (e.g. spin fifth wheel at one constant speed, comparing visual output meter and recorder chart values).

## **VEHICLE PREPARATION**

**Weight** — the weight of the driver, test equipment, and ballast shall equal 200 lb. Added weight should be distributed in the saddle or carrier if so equipped.

**Tire Pressure** — Inflate tires to manufacturer's recommended pressure for the vehicle weight (weight of motorcycle plus 200 lbs).

**Engine** — Set engine idle speed and ignition timing in accordance with the manufacturer's recommendations. If equipped with an adjustable engine speed governor, it too should be adjusted as recommended by the manufacturer.

**Thermocouple** — Install plug type thermocouple in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, as shown in Figure 1.

## **VEHICLE BRAKE SYSTEM INSPECTION**

**Required Equipment** — split service brake system (S5.1)

Motorcycle shall have either a split service brake system or two independently actuated service brake systems. Record the results on Data Sheet 2.

**Mechanical service brake system (S5.1.1)**

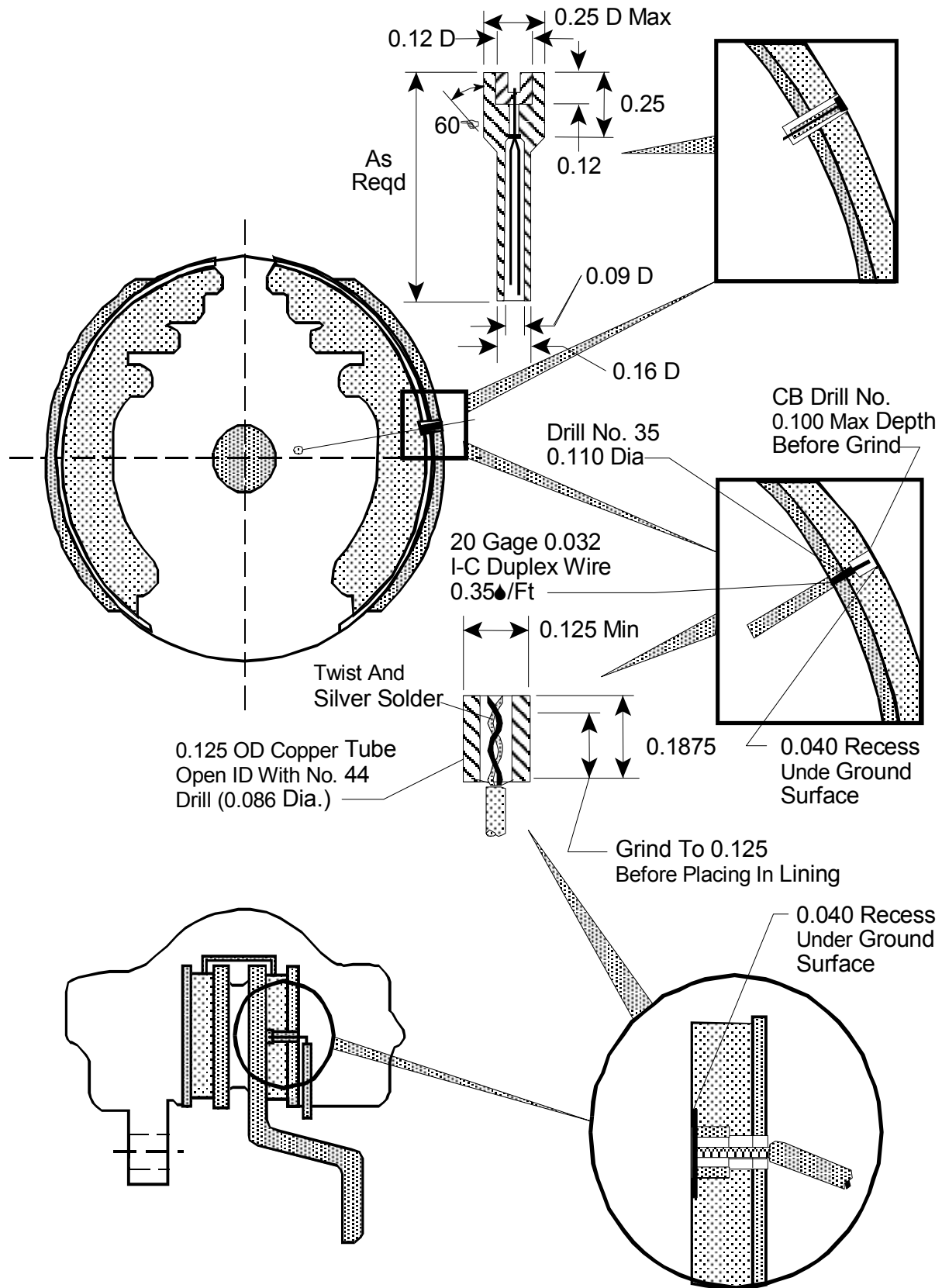
Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle. Record the results on Data Sheet 2.

**Hydraulic Service Brake System (S5.1.2)**

Leakage failure in hydraulic service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle. Record the results on Data Sheet 2.

## **11. PRETEST REQUIREMENTS....Continued**

# TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATION



## 11. PRETEST REQUIREMENTS....Continued

### Master Cylinder Reservoirs (S5.1.2.1)

Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to one and one-half times the total fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where adjustment is a factor, the worst condition of adjustment shall be used for this measurement. Record the results on Data Sheet 2.

### Reservoir labeling (S5.1.2.2)

Each motorcycle shall have a brake fluid warning statement that reads as follows, in letters at least 0.09375 inches high:

WARNING: Clean filler cap before removing. Use only \_\_\_\_ fluid from a sealed container. (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., DOT 3.)

The lettering shall be —

- (1) Permanently affixed, engraved, or embossed
- (2) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap
- (3) Of a color that contrasts with its background, if it is not engraved or embossed

Record the results on Data Sheet 2.

### Split service brake system (S5.1.3)

In addition to the other brake system equipment required, each motorcycle equipped with a split service brake system shall have a failure indicator lamp. Record the results on Data Sheet 2.

### Failure Indicator Lamp (S5.1.3.1)

- (1) One or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated —

## 11. PRETEST REQUIREMENTS....Continued

- (A) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 pounds of pedal force upon the service brake.
  - (B) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than one-half the fluid reservoir capacity, whichever is the greater.
- (2) All failure indicator lamps shall be activated when the ignition switch is turned from the "off" to the "on" or to the "start" position.

Record the results on Data Sheet 2.

- (3) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position. An indicator lamp activated when the ignition is turned to the "start" position shall be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system.
- (4) Each indicator lamp shall have a red lens with the legend "Brake Failure" on or adjacent to it in letters not less than 0.09375 inches high that shall be legible to the driver in daylight when lighted.

Record the results on Data Sheet 2.

#### Parking Brake (S5.1.4)

Each three-wheeled motorcycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement. Record the results on Data Sheet 2.

#### Other Requirements (S5.1.5)

The brake system shall be installed so that the lining thickness of the drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining may be visually inspected without removing the pads. Record the results on Data Sheet 2.

## 12. COMPLIANCE TEST EXECUTION

## 12.1 BRAKE TEST SEQUENCE AND REQUIREMENTS

	TEST SEQUENCE	T.P.*	REQMTS
1.	Instrumentation Check	S7.2	
2.	First (Preburnish) effectiveness test		
	(A) Service brake system	S7.3.1	S5.2.1
	(B) Partial service brake system	S7.3.2	S5.2.2
3.	Burnish procedure	S7.4	
4.	Second effectiveness test	S7.5	S5.3
5.	First fade and recovery test	S7.6	S5.4
6.	Reburnish	S7.7	
7.	Final effectiveness test:		
	(A) Service brake system	S7.8.1	S5.5.1
	(B) Partial service brake system	S7.8.2	S5.5.2
8.	Parking brake test (3-wheeled only)	S7.9	S5.6
9.	Water recovery test	S7.10	S5.7
10.	Design durability	S7.11	S5.8

### ENVIRONMENTAL CONDITIONS

Temperature — Ambient temperature shall be between 32EF and 100EF.

Wind — Under no circumstances shall tests be conducted with the wind velocity exceeding 15 mph. Tests shall not be conducted either into or with winds exceeding 10 mph whose directions are within 45 degrees (left or right - front and rear) of the vehicles's longitudinal centerline.

Road Surface — Road tests are conducted on level roadway with a skid number of 81. The roadway is 8 feet wide for two-wheeled motorcycles, and overall vehicle width plus 5 feet for three-wheeled motorcycles. The parking brake test surface is clean, dry, smooth portland cement concrete.



## **12. COMPLIANCE TEST EXECUTION....Continued**

### **12.2 GENERAL**

Brake Temperature — Unless otherwise specified, the initial brake temperature is to be between 130EF and 150EF.

Brake Actuation Forces — Unless otherwise specified, the force applied to the hand lever is not less than 5 pounds and not more than 55 pounds, and the foot pedal force is not less than 10 pounds and not more than 90 pounds. The point of initial application of the lever forces is 1.2 inches from the end of the brake lever grip. The direction of the force is perpendicular to the handle grip on the plane along which the brake lever rotates, and the point of application of the pedal force is the center of the foot contact pad of the brake pedal. The direction of the force is perpendicular to the foot contact pad on the plane along which the brake pedal rotates, as shown in Figure 2.

Stopping Procedure —

- A. Attain a speed 4 to 8 mph greater than test speed.
- B. Relax the throttle or fuel control.
- C. When test speed is reached, disengage clutch and apply the brake pedal or lever as the specific test requirement dictates.
- D. Stops should be made with the motorcycle aligned in the center of the roadway at the start of each brake application. Stops are made without any part of the motorcycle leaving the roadway and without any wheel lockup.

Limited Speed — Measure the speed which the motorcycle will attain in a distance of one mile from a standing start. Record the results on Data Sheet 2. If the speed is less than 60 mph, tests specified to commence at that speed shall be done at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown on the page after Figure 2.

### **12.3 BRAKE WARMING (S7.1)**

Heat the brakes to not less than 130EF and not more than 150EF (unless otherwise specified) by making not more than 10 brake stops from 30 mph at a deceleration of not more than 10 fpsps. On independently operated brake systems, the coldest brake shall be within 10EF of the hottest brake.

### **12.4 INSTRUMENTATION CHECK (S7.2)**

Measure motorcycle curb weight: front, rear, total

Measure motorcycle test weight: front, rear, total

## **12. COMPLIANCE TEST EXECUTION....Continued**

## DIRECTION OF FORCE

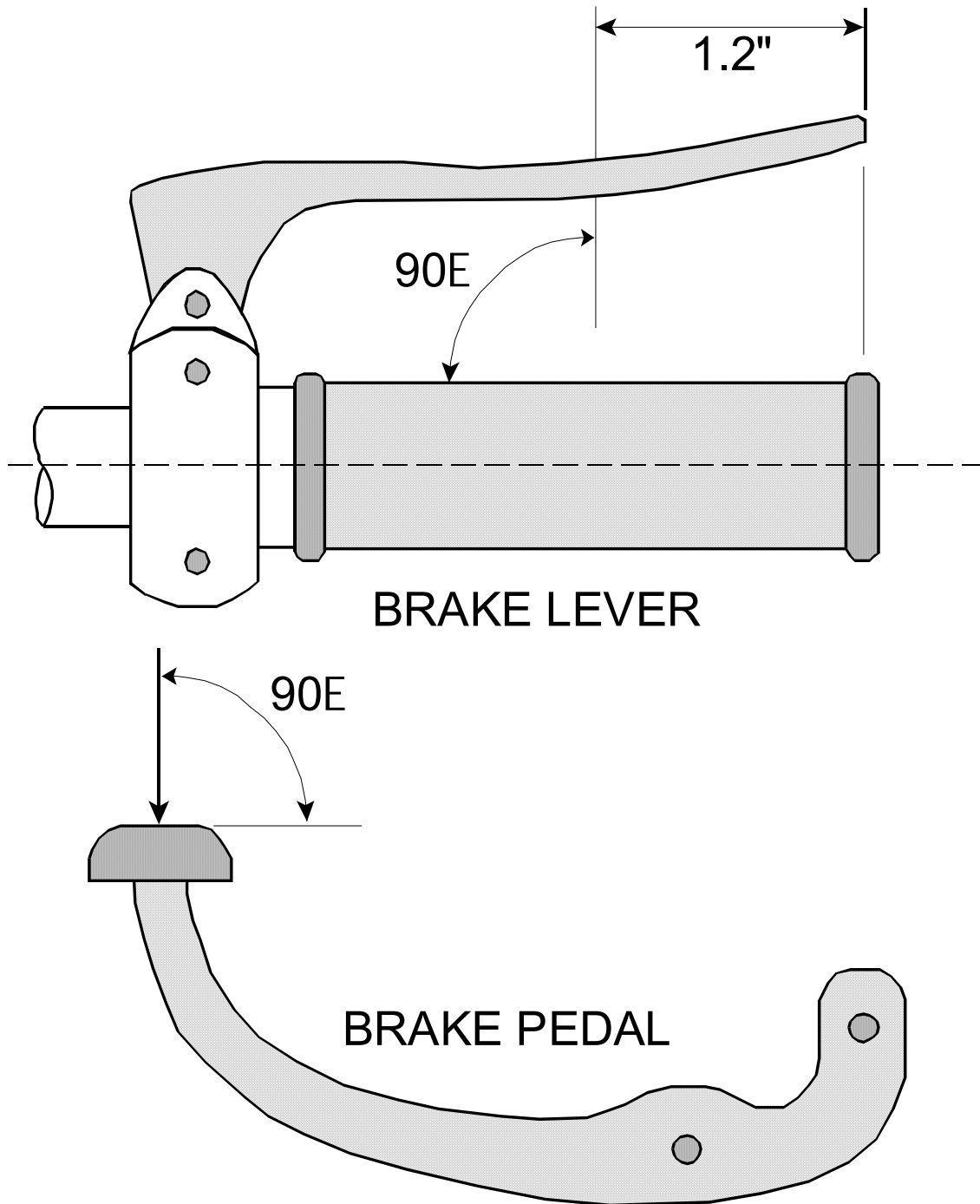


FIGURE 2

### 12. COMPLIANCE TEST EXECUTION...Continued

**SPEED AND STOPPING DISTANCE FOR TESTS INDICATED**

<b>Speed</b>	<b>Preburnish Effectiveness Total System</b>	<b>Preburnish Effectiveness Partial Mech.</b>	<b>Effectiveness Total System</b>	<b>Effectiveness Partial Hydraulic System</b>
<b>(mph)</b>	<b>(feet)</b>	<b>(feet)</b>	<b>(feet)</b>	<b>(feet)</b>
15	13	30	11	25
20	24	54	19	44
25	37	84	30	68
30	54	121	43	97
35	74	165	58	132
40	96	216	75	173
45	121	273	95	218
50	150	337	128	264
55	181	407	155	326
60	216	484	185	388
65	—	—	217	455
70	—	—	264	527
75	—	—	303	606
80	—	—	345	689
85	—	—	389	778
90	—	—	484	872
95	—	—	540	971
100	—	—	598	1,076
105	—	—	659	1,188
110	—	—	723	1,302
115	—	—	791	1,423
120	—	—	861	1,549

Check the instrumentation by making not more than 10 stops from a speed of not more than 30 mph at a deceleration of not more than 10 fpsps. Record the results on Data Sheet 3. If instrument repair, replacement or adjustment is made, perform an additional check as previously described.

## **12. COMPLIANCE TEST EXECUTION....Continued**

### **12.5 FIRST EFFECTIVENESS TEST — TOTAL SERVICE BRAKE SYSTEM (S7.3.1)**

Make 6 stops from 30 mph. The requirement is that at least 1 stop is completed within 54 feet.

Make 6 stops from 60 mph. The requirement is that at least 1 stop is completed within 216 feet.

Record the results on Data Sheet 4.

### **12.6 FIRST EFFECTIVENESS TEST — PARTIAL SERVICE BRAKE SYSTEM (S7.3.2)**

(Applies to a motorcycle with two independently activated service brake systems)

Using each brake system individually make 6 stops from 30 mph. The requirement is that at least 1 stop is completed within 121 feet.

Using each brake system individually make 6 stops from 60 mph. The requirement is that at least 1 stop is completed within 484 feet. Record the results on Data Sheet 5.

### **12.7 BURNISH PROCEDURE (S7.4)**

Burnish the brakes by making 200 stops from 30 mph at 12 fpsps deceleration. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130EF and 150EF or 1 mile, whichever occurs first. Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop. Speed should not exceed 30 mph between stops. (The hand lever and foot pedal force limits do not apply during this procedure.)

Adjust brakes in accordance with manufacturer's recommendation. Record observations on Data Sheet 6.

### **12.8 SERVICE BRAKE SYSTEM — SECOND EFFECTIVENESS TEST (S7.5)**

Make 6 stops from 30 mph. The requirement is that at least 1 stop is completed within 43 feet.

Make 6 stops from 60 mph. The requirement is that at least 1 stop is completed within 185 feet.

Make 4 stops from 80 mph. The requirement is that at least 1 stops is completed within 345 feet.

## **12. COMPLIANCE TEST EXECUTION....Continued**

### **12.9 SERVICE BRAKE SYSTEM — SECOND EFFECTIVENESS TEST (S7.5)**

Make 4 stops from the multiple of 5 mph that is 4 mph to 8 mph less than the maximum speed attainable in 1 mile, but not to exceed 120 mph. Record the results on Data Sheet 7.

### **12.10 SERVICE BRAKE SYSTEM — FADE AND RECOVERY TEST (S7.6)**

(This procedure does NOT apply to a motor-driven cycle whose speed attainable in one mile is 30 mph or less)

#### **12.10.1 BASELINE CHECK STOPS (S7.6.1)**

Make 3 stops from 30 mph at 10 to 11 fpsps for each stop. Record the average of the maximum brake pedal forces and the maximum brake lever forces required for the stops on Data Sheet 8.

#### **12.10.2 FADE STOPS (S7.6.2)**

Make 10 stops from 60 mph at a deceleration rate of 14 to 17 fpsps for each stop. The initial brake temperature shall be between 130EF and 150EF. Achieve the required deceleration as quickly as possible and maintain at least this rate for not less than three-fourths of the total stopping distance for each stop. The interval between the starts of service brake applications shall be 0.4 mile. After the last fade stop drive 1 mile at 30 mph and immediately conduct the recovery test.

#### **12.10.3 RECOVERY TEST (S7.6.3)**

Make 5 stops from 30 mph at a deceleration of 10 to 11 fpsps for each stop. The braking interval shall not be more than 1 mile. After each stop accelerate at maximum rate to 30 mph and maintain that speed until making the next stop. Record observations on Data Sheet 8.

### **12.11 SERVICE BRAKE SYSTEM — REBURNISH (S7.7)**

(This procedure does NOT apply to a motor-driven cycle whose speed attainable in one mile is 30 mph or less.

Burnish the brakes by making 35 stops from 30 mph at 12 fpsps deceleration. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130EF and 150EF or 1 mile, whichever occurs first.

Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop. Speed should not exceed 30 mph between stops. (The hand lever and foot pedal force limits do not apply during this procedure.)

Adjust brakes in accordance with manufacturer's recommendation. Record observations on Data Sheet 9.

## **12. COMPLIANCE TEST EXECUTION....Continued**

### **12.12 SERVICE BRAKE SYSTEM — FINAL EFFECTIVENESS TEST (S7.8)**

(This procedure does NOT apply to a motor-driven cycle whose speed attainable in one mile is 30 mph or less.

#### **12.12.1 SERVICE BRAKE SYSTEM (S7.8.1)**

Make 6 stops from 30 mph. The requirement is that at least 1 stop is completed within 43 feet.

Make 6 stops from 60 mph. The requirement is that at least 1 stop is completed within 185 feet.

Make 4 stops from 80 mph. The requirement is that at least 1 stops is completed within 345 feet.

Make 4 stops from the multiple of 5 mph that is 4 mph to 8 mph less than the speed attainable in 1 mile if that speed is 95 mph or greater, but not to exceed 120 mph. See Section 12.2 for the applicable total system effectiveness stopping distance. Record the results on Data Sheet 10.

#### **12.12.2 PARTIAL SERVICE BRAKE SYSTEM (S7.8.2)**

Alter the service brake system on 3-wheeled motorcycles or motorcycles equipped with a split service brake system to induce a complete loss of braking in any 1 subsystem. Determine the line pressure or pedal force necessary to cause the brake system failure indicator to operate. Make 6 stops from 30 mph and then 6 stops from 60 mph with an initial brake temperature between 130 and 150EF. Repeat for each subsystem. Determine that the brake failure indicator is operating when the master cylinder fluid level is less than the recommended safe level specified by the manufacturer or to less than 1/2 the fluid reservoir capacity, whichever is the greater. All failure indicator lamps shall be activated when the ignition switch is turned from the "off" to the "on" or to the "start" position. Each indicator lamp once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position. An indicator lamp activated when the ignition is turned to the "start" position shall be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system. Check for proper operation with each reservoir in turn at a low level. Restore the system to normal at completion of this test. Record results and observations on Data Sheet 11.

### **12.13 PARKING BRAKE TEST (S7.9)**

(This procedure applies ONLY to 3-wheeled motorcycles)

Starting with an initial brake temperature of not more than 150EF, drive the motorcycle downhill on the 30 percent grade with the longitudinal axis of the

## **12. COMPLIANCE TEST EXECUTION....Continued**

motorcycle in the direction of the grade. Apply the service brakes with a force not exceeding 90 lbs to stop the motorcycle and place the transmission in neutral. Apply the parking brake by exerting a force not more than 90 lb for a foot-operated system and 55 lb for a hand operated system. Release the service brake and allow the motorcycle to remain at rest (to the limit of traction of the braked wheels) for 5 minutes. Repeat the test with the motorcycle parked in the reversed (uphill) position on the grade. Record observations on Data Sheet 12.

### **12.14 SERVICE BRAKE SYSTEM - WATER RECOVERY TEST (S7.10)**

#### **12.14.1 BASELINE CHECK STOPS (S7.10.1)**

Make 3 stops from 30 mph at 10 to 11 fpsps for each stop. Compute the average of the maximum brake pedal forces and of the maximum brake lever forces required for the 3 stops.

#### **12.14.2 WET BRAKE RECOVERY STOPS (S7.10.2)**

Complete immerse the rear brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Next completely immerse the front brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Perform the entire wetting procedure in not more than 7 minutes. Immediately after removal of the front brake from water accelerate at a maximum rate to 30 mph without a brake application. Immediately upon reaching that speed make 5 stops, each from 30 mph at 10 to 11 fpsps deceleration for each stop. After each stop (except the last) accelerate the motorcycle at a maximum rate to 30 mph and begin the next stop, record data and observations on Data Sheet 13.

### **12.15 FINAL INSPECTION (S7.11)**

Upon completion of all the tests inspect the brake system in an assembled condition, for compliance with the brake lining inspection requirements. Disassemble all brakes and inspect:

- A. The entire brake system for detachment or fracture of any component.
- B. Brake linings for detachment from the shoe or pad.
- C. Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage.

Observations and data should be recorded on Data Sheet 14.

### **13. POST TEST REQUIREMENTS**

The contractor shall re-verify all instrumentation and check data sheets and photographs. Make sure data is recorded in all data block on every compliance test data sheet.



## 14. REPORTS

### 14.1 MONTHLY STATUS REPORTS

The contractor shall submit a monthly Test Status Report and a Vehicle or Equipment Status Report to the COTR. The Vehicle or Equipment Status Report shall be submitted until all vehicles or items of equipment are disposed of. Samples of the required Monthly Status Reports are contained in the report forms section.

### 14.2 APPARENT NONCOMPLIANCE

Any indication of a test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). A Notice of Test Failure (see report forms section) with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included. In the event of a test failure, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

### 14.3 FINAL TEST REPORTS

#### 14.3.1 COPIES

In the case of a test failure, **SEVEN** copies of the Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in the "Report Section".

Where there has been no indication of a test failure, **THREE** copies of each Final Test Report shall be submitted to the COTR within three weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until the Final Test Report is accepted by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in typed draft form within two weeks after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program. Contractors are required to **PROOF READ** all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

## 14. REPORTS....Continued

### 14.3.2 REQUIREMENTS

The Final Test Report, associated documentation (including photographs) are relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete document capable of standing by itself.

The contractor should use **detailed** descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much detail as possible in the report.

Instructions for the preparation of the first three pages of the final test report are provided below for the purpose of standardization.

### 14.3.3 FIRST THREE PAGES

#### A. FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

- (1) Final Report Number such as 122-ABC-9X-001, where —  
     122    is the FMVSS tested  
     ABC    are the initials for the laboratory  
     9X     is the Fiscal Year of the test program  
     001    is the Group Number (001 for the 1st test,  
             002 for the 2nd test, etc.)

- (2) Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 122  
 Motorcycle Brake Systems  
 \* \* \* \* \*  
 World Bikes Corporation  
 199X Ace Super Glide  
 NHTSA No. CX1201

- (3) Contractor's Name and Address such as

COMPLIANCE TESTING LABORATORIES, INC.  
 4335 West Dearborn Street  
 Detroit, Michigan 48090

## 14. REPORTS....Continued

**NOTE:** DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (3) AND (4)

- (4) Date of Final Report completion
- (5) The words "FINAL REPORT"
- (6) The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance  
400 Seventh Street, SW  
Room 6115 (NSA-30)  
Washington, DC 20590

**14. REPORTS....Continued****B. FIRST PAGE AFTER FRONT COVER**

A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows

This publication is distributed by the U. S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: \_\_\_\_\_

Approved By: \_\_\_\_\_

Approval Date: \_\_\_\_\_

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: \_\_\_\_\_

Acceptance Date: \_\_\_\_\_

**14. REPORTS....Continued****C. SECOND PAGE AFTER FRONT COVER**

A completed Technical Report Documentation Page (Form DOT F1700.7) shall be completed for those items that are applicable with the other spaces left blank. Sample data for the applicable block numbers of the title page follows.

**Block 1 — REPORT NUMBER**

122-ABC-9X-001

**Block 2 — GOVERNMENT ACCESSION NUMBER**

Leave blank

**Block 3 — RECIPIENT'S CATALOG NUMBER**

Leave blank

**Block 4 — TITLE AND SUBTITLE**

Final Report of FMVSS 122 Compliance Testing of 199X Ace Super  
Glider, NHTSA No. CX1201

**Block 5 — REPORT DATE**

March 1, 199X

**Block 6 — PERFORMING ORGANIZATION CODE**

ABC

**Block 7 — AUTHOR(S)**

John Smith, Project Manager / Bill Doe, Project Engineer

**Block 8 — PERFORMING ORGANIZATION REPORT NUMBER**

ABC-DOT-XXX-001

**Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS**

ABC Laboratories  
405 Main Street  
Detroit, MI 48070

**14. REPORTS....Continued****Block 10 — WORK UNIT NUMBER**

Leave blank

**Block 11 — CONTRACT OR GRANT NUMBER**

DTNH22-9X-D-12345

**Block 12 — SPONSORING AGENCY NAME AND ADDRESS**

US Department of Transportation  
National Highway Traffic Safety Administration  
Safety Assurance  
Office of Vehicle Safety Compliance (NSA-30)  
400 Seventh Street, SW, Room 6115  
Washington, DC 20590

**Block 13 — TYPE OF REPORT AND PERIOD COVERED**

Final Test Report  
Feb. 15 to Mar. 15, 199X

**Block 14 — SPONSORING AGENCY CODE**

NSA-30

**Block 15 — SUPPLEMENTARY NOTES**

Leave blank

**Block 16 — ABSTRACT**

Compliance tests were conducted on the subject 199X Ace Super Glider motorcycle in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-122-0X for the determination of FMVSS 122 compliance. Test failures identified were as follows:

None

**NOTE:** Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

**14. REPORTS....Continued****Block 17 — KEY WORDS**

Compliance Testing  
Safety Engineering  
FMVSS 122

**Block 18 — DISTRIBUTION STATEMENT**

Copies of this report are available from —

National Highway Traffic Safety Administration  
Technical Reference Division  
Room 5108 (NAD-52)  
400 Seventh St., SW  
Washington, DC 20590  
Telephone Number 202-366-4946

**Block 19 — SECURITY CLASSIFICATION OF REPORT**

Unclassified

**Block 20 — SECURITY CLASSIFICATION OF PAGE**

Unclassified

**Block 21 — NUMBER OF PAGES**

Add appropriate number

**Block 22 — PRICE**

Leave blank

## **14. REPORTS....Continued**

### **14.3.4 TABLE OF CONTENTS**

Final test report Table of Contents shall include the following:

- A. Section 1 — Purpose of Compliance Test
- B. Section 2 — Compliance Data Summary
- C. Section 3 — Test Data
- D. Section 4 — Test Equipment List and Calibration Information
- E. Section 5 — Photographs
- F. Section 6 — Notice of Test Failure (if applicable)



## 15. DATA SHEETS

### DATA SHEET 1

#### TEST SUMMARY

VEH NHTSA NO.: \_\_\_\_\_ ; TEST DATE: \_\_\_\_\_

TEST SUMMARY	SPEED (mph)	DECEL.		STOP. DIST. (ft)	MAX. BRAKE LEVER FORCE (lb)	MAX. BRAKE PEDAL FORCE (lb)	NUMBER OF TESTS
		Max	Avg				
Instrumentation Check							
1st Effectiveness Test (Service Brake System)							
1st Effectiveness Test (Partial)							
1st Burnish Procedure							
2nd Effectiveness Test							
1st Fade and Recovery (Baseline)							
1st Fade and Recovery (Fade Test)							
1st Fade and Recovery (Recovery)							
2nd Burnish Procedure							
Final Effectiveness Test							
Water Recovery (Base line)							
Water Recovery (Recovery)							
Final Inspection							

## 15. DATA SHEETS....Continued

### DATA SHEET 2

#### VEHICLE BRAKE SYSTEM INSPECTION

VEH NHTSA NO.: \_\_\_\_\_ ; TEST DATE: \_\_\_\_\_

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
S5.1 - Motorcycle shall have either a split service brake system or two independently actuated service brake systems.	Motorcycle has split service brake system?		
	Motorcycle has two independently actuated service brake systems?		
S5.1.1 - Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle.	If vehicle has a mechanical service brake system, would component failure result in loss of braking in other service brake system?		
S5.1.2 - Leakage failure in hydraulic service brake system shall not result in a loss of braking ability in other service brake system on the vehicle.	If vehicle has hydraulic service brake system, would leakage failure in one service brake system result in a loss of braking ability in other service brake system?		
S5.1.2.1 - Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to one and one-half times the total fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where adjustment is a factor, the worst condition of adjustment shall be used for this measurement. (See Appendix 2 for information on reservoir capacity measurement)	Vehicle meets master cylinder reservoir requirements?		
S5.1.2.2 - Each motorcycle shall have a brake fluid warning statement that reads as follows, in letters at least three thirty-seconds of an inch high: <b>Warning: clean filler cap before removing. Use only ---fluid from a sealed container.</b> (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., DOT 3.) The lettering shall be: (A) Permanently affixed, engraved, or embossed (B) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap (C) Of a color that contrasts with its background, if it is not engraved or embossed	Vehicle meets master cylinder warning statement requirements?		
	Type of brake fluid required?		

(Continued on next page)

## 15. DATA SHEETS....Continued

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
<p>S5.1.3 -</p> <p>(A) Each motorcycle equipped with a split service brake system shall have one or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated —</p> <p>(1) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 lb of pedal force upon the service brake.</p> <p>(2) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than one-half the fluid reservoir capacity, whichever is the greater.</p> <p>(B) All failure indicator lamps shall be activated when the ignition switch is turned from the "off" to the "on" or to the "start" position.</p> <p>(C) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position. An indicator lamp activated when the ignition is turned to the "start" position will be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system.</p> <p>(D) Each indicator lamp shall have a red lens with the legend "Brake Failure" on or adjacent to it in letters not less than three thirty-seconds of an inch high that shall be legible to the driver in daylight when lighted.</p>	Does vehicle have a brake system failure indicator lamp?		
	Does failure indicator lamp conform to operational and physical requirements?		
S5.1.4 - Each three-wheeled motorcycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement.	If vehicle is a three-wheeled motorcycle, is vehicle equipped with a parking brake?		
S5.1.5 - The brake system shall be installed so that the lining thickness of the drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining may be visually inspected without removing the pads.	Can the drum brake lining thickness or disc brake friction lining thickness be determined without removal of drum or disc brake pads?		

COMMENTS:

RECORDED BY: \_\_\_\_\_ ; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

# 15. DATA SHEETS....Continued

## DATA SHEET 3 INSTRUMENTATION CHECK (S7.2)

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE:\_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

VEHICLE WEIGHT - FRONT REAR TOTAL

VEH CURB WT: \_\_\_\_\_ lbs \_\_\_\_\_ lbs \_\_\_\_\_ lbs

VEH TEST WT: \_\_\_\_\_ lbs \_\_\_\_\_ lbs \_\_\_\_\_ lbs

REQUIREMENTS: Check instrumentation by making not more than 10 stops from 30 mph at a deceleration of not more than 10 fpsps, record results, repeat if necessary.

### 30 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
3								
5								
7								
10								

### MOTORCYCLE MAXIMUM SPEED DETERMINATION —

REQUIREMENTS: Measure the speed which the motorcycle will attain in a distance of one mile from a standing start. If the speed is less than 60 mph, tests specified to commence at that speed shall be done at the multiple of 5 mph that is 4 to 8 mph less than the maximum speed measured.

M/C SPEED ATTAINABLE IN 1 MILE: \_\_\_\_\_ mph

RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_

APPROVED BY:

**15. DATA SHEETS....Continued**

**DATA SHEET 4**

**FIRST EFFECTIVENESS TEST (S7.3.1)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

**REQUIREMENTS:**

- A. Make the following stops:
- (1) 6 stops from 30 mph
  - (2) 6 stops from 60 mph
- Utilize both brakes, no wheel lockup, initial brake temperature between 130EF and 150EF.
- B. Compliance to S122 requires 1 stop at each of the following:
- (1) 30 mph within 54 feet
  - (2) 60 mph within 216 feet

30 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)

**15. DATA SHEETS....Continued**

60 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

REMARKS:

RECORDED BY: \_\_\_\_\_ ; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued**

**DATA SHEET 5****PARTIAL SERVICE BRAKE SYSTEM TEST (7.3.2)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

**REQUIREMENTS:**

- A. Make the following stops:  
 (1) 6 stops from 30 mph  
 (2) 6 stops from 60 mph  
 Utilizing each brake system independently, no wheel lockup, initial brake temperature between 130EF and 150EF.
- B. Compliance to S122 requires 1 stop at each of the following (for each brake system independently):  
 (1) 30 mph within 121 feet  
 (2) 60 mph within 484 feet

30 MPH DATA — Brake System 1, Describe: \_\_\_\_\_

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MAX	AVG	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)

# 15. DATA SHEETS....Continued

## 60 MPH DATA — Brake System 1

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

REMARKS:

30 MPH DATA — Brake System 2, Describe: \_\_\_\_\_

---

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)



**15. DATA SHEETS....Continued**

60 MPH DATA — Brake System 2

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

REMARKS:

RECORDED BY: \_\_\_\_\_ ;

DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued**

## DATA SHEET 6

### BURNISH PROCEDURE (S7.4)

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

#### REQUIREMENTS:

- A. Burnish the brakes by making 200 stops from 30 mph at 12 fpsps deceleration
- B. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130EF and 150EF or 1 mile whichever comes first
- C. Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop
- D. Hand lever and foot pedal force limits do not apply during this procedure

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MAX	AVG	FRT	RR
1								
25								
50								
75								
100								
125								
150								
175								
200								

(Continued on next page)

**15. DATA SHEETS....Continued**

OBSERVATIONS:

RECORDED BY: \_\_\_\_\_ ; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued**

**DATA SHEET 7****SECOND EFFECTIVENESS TEST (S7.5)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

**REQUIREMENTS:****A. Make stops as follows:**

- (1) 6 stops from 30 mph
  - (2) 6 stops from 60 mph
  - (3) 4 stops from 80 mph
  - (4) 4 stops from vehicle maximum speed not to exceed 120 mph
- Utilize both brakes, no wheel lockup, initial brake temperature between 130EF and 150EF.

**B. Compliance to S122 requires 1 stop at each of the following:**

- (1) 30 mph within 43 feet
- (2) 60 mph within 185 feet
- (3) 80 mph within 345 feet

Maximum vehicle speed \_\_\_\_\_ mph within \_\_\_\_\_ feet (see column 3, table 12.1).

**30 MPH DATA**

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)

# 15. DATA SHEETS....Continued

60 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

80 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								

TOP VEHICLE SPEED DATA — Top Vehicle Speed is \_\_\_\_ mph. Required Stopping Distance is \_\_\_\_ feet.

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MAX	AVG	FRT	RR
1								
2								
3								
4								

(Continued on next page)

### 15. DATA SHEETS....Continued

OBSERVATIONS:

RECORDED BY: \_\_\_\_\_ ; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued**

**DATA SHEET 8****FADE AND RECOVERY TEST (S7.6)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

REQUIREMENT: Conduct three 30 mph stops at 10-11 fpsps, compute average maximum brake pedal and lever forces and record data.

**30 MPH DATA — Fade and Recovery Baseline Data (S7.6.1)**

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								

AVERAGE MAX BRAKE PEDAL FORCE = \_\_\_\_\_ lbs

AVERAGE MAX BRAKE LEVER FORCE = \_\_\_\_\_ lbs

OBSERVATIONS:

(Continued on next page)

**15. DATA SHEETS....Continued**

REQUIREMENTS: Conduct 10 fade stops from 60 mph at a deceleration rate of 14-17 fpsps with initial brake temperature between 130EF and 150EF, conduct 5 fade recovery stops from 30 mph at 10-11 fpsps and record data.

60 MPH DATA — Fade Stops (S7.6.2)

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

30 MPH DATA — Recovery Test (S7.6.3)

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								



RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

# **15. DATA SHEETS....Continued**

## **DATA SHEET 9**

### **RE-BURNISH PROCEDURE (S7.7)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

#### **REQUIREMENTS:**

- A. Burnish the brakes by making 35 stops from 30 mph at 12 fpsps deceleration
- B. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130EF and 150EF or 1 mile whichever comes first
- C. Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop
- D. Hand lever and foot pedal force limits do not apply during this procedure

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
15								
35								

#### **OBSERVATIONS:**

RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued****DATA SHEET 10****FINAL EFFECTIVENESS TEST (S7.8.1)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) — FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING — START: \_\_\_\_\_ FINISH: \_\_\_\_\_

**REQUIREMENTS:****A. Make the following stops:**

(1) 6 stops from 30 mph

(2) 6 stops from 60 mph

(3) 4 stops from 80 mph

(4) 4 stops from vehicle maximum speed not to exceed 120 mph

Utilize both brakes, no wheel lockup, initial brake temperature between 130EF and 150EF.

**B. Compliance to S122 requires 1 stop at each of the following:**

(1) 30 mph within 43 feet

(2) 60 mph within 185 feet

(3) 80 mph within 345 feet

Maximum vehicle speed \_\_\_\_\_ mph within \_\_\_\_\_ feet (see column 3, table 12.1).

30 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)

**15. DATA SHEETS....Continued**

60 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

80 MPH DATA —

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								

TOP VEHICLE SPEED DATA — Top Vehicle Speed is \_\_\_\_ mph. Required Stopping Distance is \_\_\_\_ feet.

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								

(Continued on next page)

### 15. DATA SHEETS....Continued

OBSERVATIONS:

RECORDED BY: \_\_\_\_\_ ;      DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

### 15. DATA SHEETS....Continued

## DATA SHEET 11

### PARTIAL SERVICE BRAKE SYSTEM TEST SPLIT SERVICE BRAKE SYSTEMS (S7.8.2)

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

#### REQUIREMENTS:

- A. Induce loss of braking in any one subsystem. Determine line pressure or pedal/lever force required to cause operation of the brake system failure indicator.
- B. Make the following stops:
  - (1) 6 stops from 30 mph
  - (2) 6 stops from 60 mph
 Utilize brake system not disabled.

Requirements — 1 stop within each of the following:

- (1) 30 mph within 97 feet
- (2) 60 mph within 388 feet

Initial brake temperature between 130EF and 150EF with no wheel lockup.

- C. Repeat procedure with each brake subsystem.

#### BRAKE FAILURE INDICATOR OPERATION —

Brake pedal/lever force required to cause brake failure indicator to operate \_\_\_\_\_

\_\_\_\_\_

30 MPH DATA — Brake System 1, Describe: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Continued on next page)

**15. DATA SHEETS....Continued**

## 30 MPH DATA — Brake System 1 (Continued)

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

## 60 MPH DATA — Brake System 1

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

(Continued on next page)

**15. DATA SHEETS....Continued****BRAKE FAILURE INDICATOR OPERATION —**

Brake pedal/lever force required to cause brake failure indicator to operate \_\_\_\_\_

30 MPH DATA — Brake System 2, Describe: \_\_\_\_\_

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								
5								
6								

60 MPH DATA — Brake System 2

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								
4								

5								
6								

RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

# **15. DATA SHEETS....Continued**

## **DATA SHEET 12**

### **PARKING BRAKE TEST (S7.9)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

#### **REQUIREMENTS:**

- A. Start with an initial brake temperature of not more than 150EF. Drive the motorcycle downhill on the 30 percent grade with the longitudinal axis of the motorcycle in the direction of the grade. Apply the service brakes with a force not exceeding 90 lbs to stop the motorcycle and place the transmission in neutral.
- B. Apply the parking brake with a force not exceeding 90 lbs for a foot operated system, or 55 lbs for a hand operated system. Release the service brake and allow the motorcycle to remain at rest (to the limit of traction of the braked wheels) for 5 minutes.
- C. Repeat the test with the motorcycle parked uphill on the grade.
- D. Record observations and results.

#### **OBSERVATIONS:**

RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_



APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued****DATA SHEET 13****WATER FADE AND RECOVERY TEST  
(S7.10.1) & (S7.10.2)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) — FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING — START: \_\_\_\_\_ FINISH: \_\_\_\_\_

**REQUIREMENTS:**

- A. Conduct three 30 mph stops at 10-11 fpsps using full brake system, compute average maximum brake pedal and lever forces and record data.
- B. Immerse rear brake in water fully released for 2 minutes followed by immersion of the front brake in water fully released for 2 minutes.
- C. Conduct 5 fade recovery stops from 30 mph at 10-11 fpsps using full brake system and record data.

**30 MPH DATA — Water Fade and Recovery Baseline Data**

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MA X	AV G	FRT	RR
1								
2								
3								

AVERAGE MAX BRAKE PEDAL FORCE = \_\_\_\_\_ lbs

AVERAGE MAX BRAKE LEVER FORCE = \_\_\_\_\_ lbs

OBSERVATIONS:

(Continued on next page)

**15. DATA SHEETS....Continued**

30 MPH DATA — Water Fade and Recovery Test

RUN NO.	SPEED (mph)	STOP DIST (ft)	MAX LEVER FORCE (lb)	MAX PEDAL FORCE (lb)	DECEL (fpsps)		TEMP (EF)	
					MAX	AVG	FRT	RR
1								
2								
3								
4								
5								

OBSERVATIONS:

RECORDED BY: \_\_\_\_\_ ; DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**15. DATA SHEETS....Continued****DATA SHEET 14****FINAL INSPECTION (S7.11)**

VEH NHTSA NO.: \_\_\_\_\_; AMBIENT TEMP.: \_\_\_\_EF; DATE: \_\_\_\_\_

WIND VEL/DIRECTION: \_\_\_\_\_

TIRE PRESSURE (COLD) - FRONT: \_\_\_\_\_ REAR: \_\_\_\_\_

ODOMETER READING - START: \_\_\_\_\_ FINISH: \_\_\_\_\_

REQUIREMENTS: Disassemble all brakes and inspect the following:

- A. The entire brake system for detachment or fracture of any component.
- B. Brake linings for detachment from the shoe or pad.
- C. Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage.

OBSERVATIONS:

RECORDED BY: \_\_\_\_\_; DATE: \_\_\_\_\_:

APPROVED BY: \_\_\_\_\_

**16. FORMS****REPORT OF VEHICLE CONDITION**

CONTRACT NO.: DTNH22-\_\_\_\_\_ ; DATE:\_\_\_\_\_

FROM: \_\_\_\_\_

TO: \_\_\_\_\_

The following vehicle has been subjected to compliance testing for FMVSS No. \_\_\_\_\_.

The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. All variances have been reported within 2 working days of vehicle arrival, by letter, to the NHTSA Industrial Property Manager (NAD-30), with a copy to the OVSC COTR. The vehicle is again inspected, after the above test has been conducted, and all changes are noted below. The final condition of the vehicle is also noted in detail.

MODEL YEAR/MAKE/MODEL: \_\_\_\_\_

NHTSA NO.: \_\_\_\_\_ ; BODY COLOR:\_\_\_\_\_

VEHICLE CURB WEIGHT: \_\_\_\_\_ lbs; VIN: \_\_\_\_\_

ODOMETER READINGS: Arrival - \_\_\_\_\_ miles Date - \_\_\_\_\_

Completion - \_\_\_\_\_ miles Date - \_\_\_\_\_

PURCHASE PRICE: \$ \_\_\_\_\_ ; DEALER'S NAME:\_\_\_\_\_

ENGINE DATA: \_\_\_\_\_ No. Cylinders \_\_\_\_\_ CC's \_\_\_\_\_ cubic inches

TRANSMISSION DATA: \_\_\_\_\_ No. of Speeds \_\_\_\_\_ Auto. \_\_\_\_\_ Manual

TIRE DATA: Front Size - \_\_\_\_\_; Mfr. - \_\_\_\_\_

Rear Size - \_\_\_\_\_; Mfr. - \_\_\_\_\_

Test Vehicle Condition:

\_\_\_\_\_

RECORDED BY: \_\_\_\_\_ ; DATE:\_\_\_\_\_

APPROVED BY: \_\_\_\_\_

**16. FORMS...Continued****LABORATORY NOTICE OF TEST FAILURE TO OVSC**

FMVSS NO.: 122 TEST DATE: \_\_\_\_\_

LABORATORY: \_\_\_\_\_

CONTRACT NO.: \_\_\_\_\_; DELV. ORDER NO.: \_\_\_\_\_

LABORATORY PROJECT ENGINEER'S NAME: \_\_\_\_\_

MOTORCYCLE DESCRIPTION: \_\_\_\_\_

\_\_\_\_\_

VEHICLE NHTSA NO.: \_\_\_\_\_; VIN: \_\_\_\_\_

MFR: \_\_\_\_\_

TEST FAILURE DESCRIPTION: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

FMVSS REQUIREMENT, PARAGRAPH § \_\_\_\_ : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NOTIFICATION TO COTR: \_\_\_\_\_ DATE: \_\_\_\_\_

BY: \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

**16. FORMS....Continued****MONTHLY TEST STATUS REPORT****FMVSS 122****DATE OF REPORT:**\_\_\_\_\_

<b>No.</b>	<b>MOTORCYCLE NHTSA No., MAKE &amp; MODEL</b>	<b>COMPLIAN CE TEST DATE</b>	<b>PASS/ FAIL</b>	<b>DATE REPORT SUBMITTE D</b>	<b>DATE INVOICE SUBMITTE D</b>	<b>INVOICE PAYMEN T DATE</b>
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

## 16. FORMS....Continued

**MONTHLY VEHICLE STATUS REPORT****FMVSS 122****DATE OF REPORT:** \_\_\_\_\_

<b>No.</b>	<b>MOTORCYCLE NHTSA No., MAKE &amp; MODEL</b>	<b>DATE OF DELIVERY</b>	<b>TEST COMPLETE DATE</b>	<b>VEHICLE SHIPMENT DATE</b>	<b>CONDITION OF VEHICLE</b>
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

## APPENDIX A

### Procedure for Determining Master Cylinder Volume Requirement

DISC

BRAKES:

$$V_v = (\Delta t_i + \Delta t_o) \times \frac{\pi(D)^2}{4}$$

Where:

- $V_v$  = Volume required per wheel
- $\Delta t$  = Change in thickness (average)
- $i$  = Inboard
- $o$  = Outboard
- $D$  = Caliper cylinder diameter
- $c$  = Average clearance

Using the above equation, the volume requirement for Subsystem No. 1 (LF, RR) and Subsystem No. 2 (LF, RF) were calculated as shown below:



## **APPENDIX B**

### **MOTOR VEHICLE SAFETY STANDARD NO. 122**

#### **Motorcycle Brake Systems**

**S1. SCOPE**

This standard specifies performance requirements for motorcycle brake systems.

**S2. PURPOSE**

The purpose of the standard is to insure safe motorcycle braking performance under normal and emergency conditions.

**S3. APPLICATION**

This standard applies to motorcycles.

**S4. DEFINITIONS**

**BRAKING INTERVAL**

Distance measured from the start of one brake application to the start of the next brake application.

**INITIAL BRAKE TEMPERATURE**

Temperature of the hottest service brake of the vehicle 0.2 miles before any brake application.

**SKID NUMBER**

Frictional resistance of a pavement measured in accordance with American Society for Testing and Materials (ASTM) Method E-274-70 (as revised July 1974) at 40 mph, omitting water delivery as specified in paragraphs 7.1 and 7.2 of that method.

**STOPPING DISTANCE**

Distance traveled by a vehicle from the start of the brake application to the point where the vehicle stops.

## APPENDIX B....Continued

### SPLIT SERVICE BRAKE SYSTEM

Brake system consisting of two or more subsystems actuated by a single control designed so that a leakage-type failure of a pressure component in a single subsystem (except structural failure of a housing that is common to all subsystems) shall not impair the operation of the other subsystem(s).

#### S5. REQUIREMENTS

Each motorcycle shall meet the following requirements (see Table 2) under the conditions specified in S6, when tested according to the procedures and in the sequence specified in S7. Corresponding test procedures of S7 are indicated in parentheses. If a motorcycle is incapable of attaining a specified speed, its service brakes shall be capable of stopping the vehicle from the multiple of 5 mph that is 4 mph to 8 mph less than the speed attainable in 1 mile, within stopping distances that do not exceed the stopping distances specified in Table 1.

##### S5.1 Required Equipment — Split Service Brake System

Each motorcycle shall have either a split service brake system or two independently actuated service brake systems.

##### S5.1.1 Mechanical Service Brake System

Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle.

##### S5.1.2 Hydraulic Service Brake System

A leakage failure in a hydraulic service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle each motorcycle equipped with a hydraulic brake system shall have the equipment specified in S5.1.2.1 and S5.1.2.2.

##### S5.1.2.1 Master Cylinder Reservoirs

Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to 1-1/2 times the total fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where

**APPENDIX B....Continued**

adjustment is a factor the worst condition of adjustment shall be used for this measurement.

**S5.1.2.2 Reservoir Labeling**

Each motorcycle shall have a brake fluid warning statement that reads as follows, in letters at least 3/32 of an inch high:

**TABLE 1**  
**STOPPING DISTANCES FOR EFFECTIVENESS, FADE AND**  
**PARTIAL SYSTEMS TESTS**

<b>STOPPING DISTANCE, feet</b>				
<b>EFFECTIVENESS TESTS</b>				
<b>VEHICLE TEST SPEED, mph</b>	<b>PREBURNISH EFFECTIVENE SS TOTAL SYSTEM (S5.2.1)</b>	<b>PREBURNISH EFFECTIVENE SS PARTIAL MECHANICAL SYSTEMS (S5.2.2)</b>	<b>EFFECTIVENE SS TOTAL SYSTEM (S5.4) (S5.7.1)</b>	<b>EFFECTIVENE SS PARTIAL HYDRAULIC SYSTEMS (S5.7.2)</b>
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
15	13	30	11	25
20	24	54	19	44
25	37	84	30	68
30	54	121	43	97
35	74	165	58	132
40	96	216	75	173
45	121	273	95	218
50	150	337	128	264
55	181	407	155	326
60	216	484	185	388
65			217	415
70			264	527
75			303	606
80			345	689
85			389	788

90			484	872
95			540	971
100			598	1076
105			659	1188
110			723	1302
115			791	1423
120			861	1549

**TABLE 2****BRAKE TEST SEQUENCE AND REQUIREMENTS**

<b>SEQUENCE L.C.</b>		<b>TEST PROCEDURE</b>	<b>REQUIRE- MENTS</b>
1	Instrumentation check	S7.2	
2	First (Preburnish) Effectiveness Test		
	(a) Service Brake System	S7.3.1	S5.2.1
	(b) Partial Service Brake System	S7.3.2	S5.2.2
3	Burnish Procedure	S7.4	
4	Second Effectiveness Test	S7.5	S5.3
5	First Fade and Recovery Test	S7.6	S5.4
6	Reburnish	S7.7	
7	Final Effectiveness Test		
	(a) Service Brake System	S7.8.1	S5.5.1
	(b) Partial Service Brake System	S7.8.2	S5.5.2
8	Parking Brake Test (3-wheeled motorcycles only)	S7.9	S5.6
9	Water Recovery Test	S7.10	S5.8
10	Design Durability	S7.11	S5.8

**"WARNING: Clean filler cap before removing. Use only fluid from a sealed**

## APPENDIX B....Continued

**container."** (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g. DOT 3)

The lettering shall be —

- (a) Permanently affixed, engraved or embossed;
- (b) Located So as to be visible by direct view, either on or within 4 inches of the brake fluid reservoir filler plus or cap; and
- (c) Of a color that contrasts with its background, if it is not engraved or embossed.

### S5.1.3 Split Service Brake System

In addition to the equipment required by S5.1.2 each motorcycle equipped with a split service brake system shall have a failure indicator lamp as specified in S5.1.3.1.

#### S5.1.3.1 Failure Indicator Lamp

- (a) One or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated —
  - (1) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 pounds of pedal force upon the service brake.
  - (2) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than 1/2 the fluid reservoir capacity, whichever is the greater.
- (b) All failure indicator lamps shall be activated when the ignition switch is turned from the "off," to the "on" or to the "start" position.
- (c) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp, once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position.

## APPENDIX B....Continued

An indicator lamp activated when the ignition is turned to the "start" position shall be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system.

- (d) Each indicator lamp shall have a red lens with the legend "Brake Failure" on or adjacent to it in letters not less than 3/32 of an inch high that shall be legible to the driver in daylight when lighted.

### S5.1.4 Parking Brake

Each three-wheeled motorcycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement.

### S5.1.5 Other Requirements

The brake system shall be installed so that the lining thickness of drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining thickness may be visually inspected without removing the pads.

## S5.2 Service Brake System

First (preburnish) effectiveness.

### S5.2.1 Service Brake System

The service brakes shall be capable of stopping the motorcycle from 30 mph and 60 mph within stopping distances which do not exceed the stopping distances specified in Column I of Table 1 (S7.3.1).

### S5.2.2 Partial Service Brake System

Each independently actuated service brake system on each motorcycle shall be capable of stopping the motorcycle from 30 mph and 60 mph within stopping distances which do not exceed the stopping distances specified in Column II of Table 1 (S7.3.2).

## S5.3 Service Brake System — Second Effectiveness

The service brakes shall be capable of stopping the motorcycle from 30 mph, 60 mph, 80 mph, and the multiple of 5 mph that is 4 mph to 8 mph less than the speed attainable in 1 mile if this speed is 95 mph or greater, within stopping distances that do not exceed the stopping distances specified in Column III of Table 1 (S7.5).

## APPENDIX B....Continued

### S5.4 Service Brake System — Fade And Recovery

These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

#### S5.4.1 Baseline Check — Minimum And Maximum Pedal Forces

The pedal and lever forces used in establishing the fade baseline check average shall be within the limits specified in S6.10 (S7.6.1).

#### S5.4.2 Fade

Each motorcycle shall be capable of making 10 fade stops from 60 mph at not less than 15 fpsps for each stop (S7.6.2).

#### S5.4.3 Fade Recovery

Each motorcycle shall be capable of making five recovery stops with a pedal force that does not exceed 90 pounds, and a hand lever force that does not exceed 55 pounds for any of the first 4 recovery stops and that for the 5th recovery stop is within plus 20 pounds and minus 10 pounds of the fade test baseline check average force (S7.6.3).

### S5.5 Service Brake System — Final Effectiveness

These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

#### S5.5.1 Service Brake System

The service brakes shall be capable of stopping the motorcycle in a manner that complies with S5.3 (S7.8.1).

#### S5.5.2 Hydraulic Service Brake System — Partial Failure

In the event of a pressure component leakage failure, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, the remaining portion of the service brake system shall continue to operate and shall be capable of stopping the motorcycle from 30 mph and 60 mph within stopping distances that do not exceed the stopping distances specified in Column IV of Table 1 (S7.8.2).

## APPENDIX B....Continued

### S5.6            Parking Brake System

The parking brake system shall be capable of holding the motorcycle stationary (to the limits of traction of the braked wheels), for 5 minutes, in both forward and reverse directions, on a 30 percent grade, with an applied force of not more than 90 pounds for a foot-operated system and 55 pounds for a hand-operated system (S7.9).

### S5.7            Service Brake System — Water Recovery

#### S5.7.1        Baseline Check

The pedal and lever forces used in establishing the water recovery baseline check average shall be within the limits specified in S6.10 (S7.10.1).

#### S5.7.2        Water Recovery Test

Each motorcycle shall be capable of making 5 recovery stops with a pedal force that does not exceed 90 pounds, and a hand lever force that does not exceed 55 pounds, for any of the first 4 recovery stops, and that for the 5th recovery stop is within plus 20 pounds and minus 10 pounds of the baseline check average force (S7.10.2).

### S5.8            Service Brake System Design Durability

Each motorcycle shall be capable of completing all braking requirements of S5 without detachment of brake linings from the shoes or pad, detachment or fracture of any brake system components, or leakage of fluid or lubricant at the wheel cylinder and master cylinder reservoir cover, seal, or retention device (S7.11).

### S6.            Test Conditions

The requirements of S5 shall be met under the following conditions. Where a range of conditions is specified, the motorcycle shall be capable of meeting the requirements at all points within the range.

#### S6.1           Vehicle Weight

Motorcycle weight is unloaded vehicle weight plus 200 pounds (including driver and instrumentation), with the added weight distributed in the saddle or carrier if so equipped.



**APPENDIX B....Continued****S6.2 Tire Inflation Pressure**

Tire inflation pressure is the pressure recommended by the manufacturer for the vehicle weight specified in paragraph S6.1.

**S6.3 Transmission**

Unless otherwise specified, all stops are made with the clutch disengaged.

**S6.4 Engine**

Engine idle speed and ignition timing settings are according to the manufacturer's recommendations. If the vehicle is equipped with an adjustable engine speed governor, it is adjusted according to the manufacturer's recommendation.

**S6.5 Ambient Temperature**

The ambient temperature is between 32°F and 100°F.

**S6.6 Wind Velocity**

The wind velocity is zero.

**S6.7 Road Surface**

Road tests are conducted on level roadway having a skid number of 81. The roadway is 8 feet wide for two-wheeled motorcycles, and overall vehicle width plus 5 feet for three-wheeled motorcycles. The parking brake test surface is clean, dry, smooth portland cement concrete.

**S6.8 Vehicle Position**

The motorcycle is aligned in the center of the roadway at the start of each brake application. Stops are made without any part of the motorcycle leaving the roadway and without lockup of any wheel.

**S6.9 Thermocouples**

The brake temperature is measured by plug-type thermocouples installed in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, as shown in Figure 1.

## APPENDIX B....Continued

## TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATION

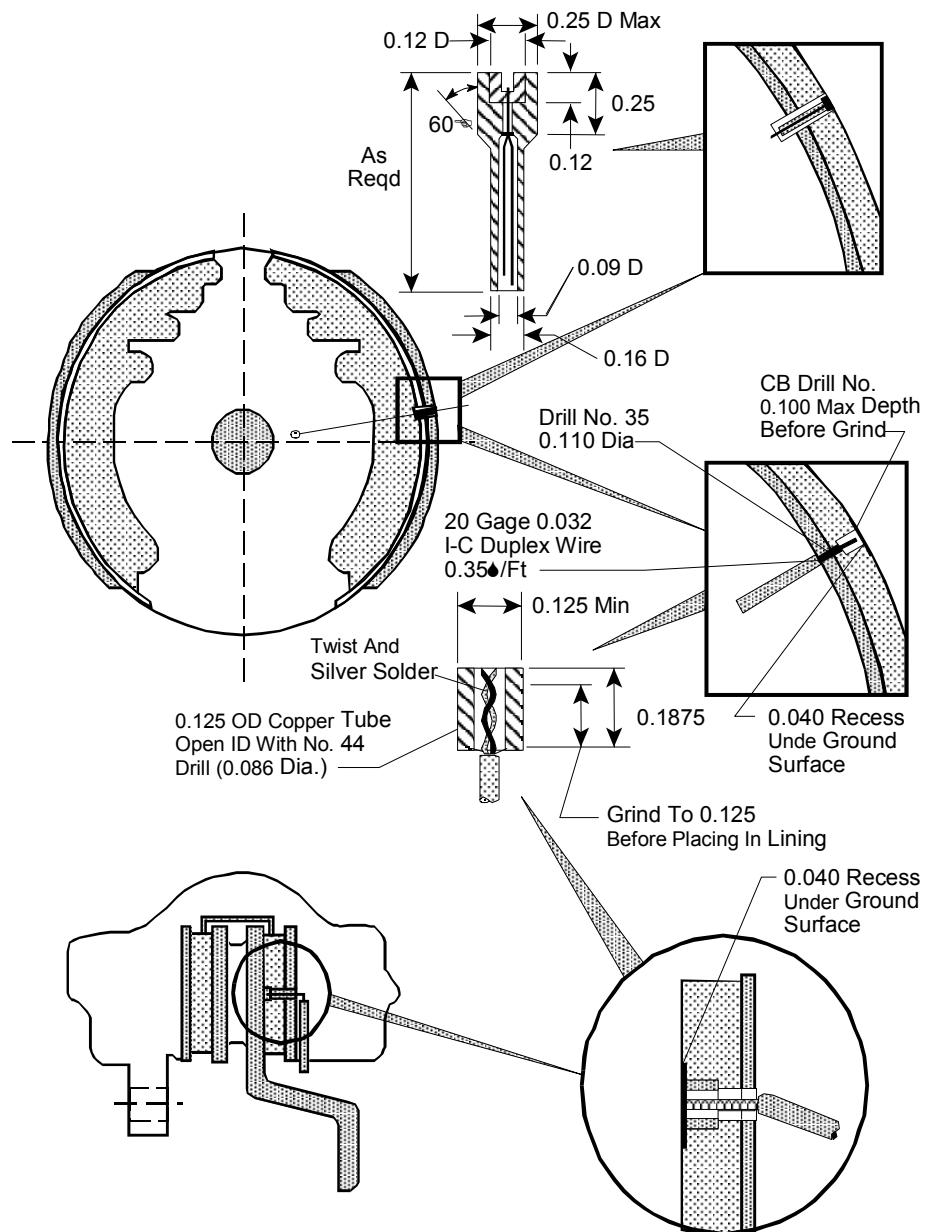
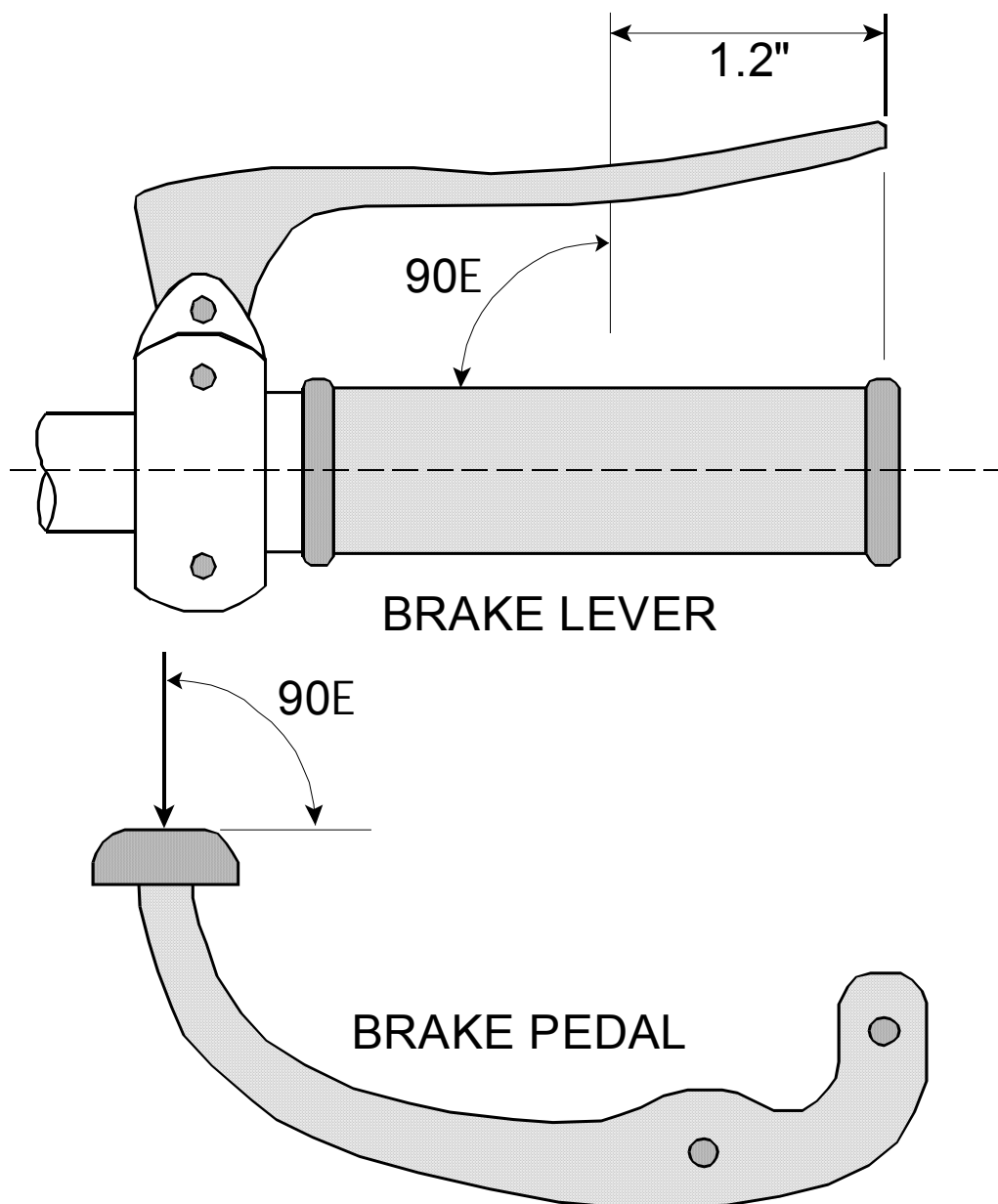


FIGURE 1

## S6.10 Brake Actuation Forces

Except for the requirements of the 5th recovery stop in S5.4.3 and S5.7.2 (S7.6.3 and S7.10.2) the hand lever force is not less than 5 and not more than 55 pounds and the foot pedal force is not less than 10 and not more than 90 pounds. The point of initial application of the lever forces is 1.2 inches from the end of the brake lever grip. The direction of the force is perpendicular to the handle grip on the plane along which the brake lever rotates, and the point of application of the pedal force is the center of the foot contact pad of the brake pedal. The direction of the force is perpendicular to the foot contact pad on the plane along which the brake pedal rotates, as shown in Figure 2.

## DIRECTION OF FORCE



**FIGURE 2**

### S7. Test Procedures And Sequence

Each motorcycle shall be capable of meeting all the requirements of this standard when tested according to the procedures and in the sequence set forth below without replacing any brake system part, or making any adjustments to the brake system other than as permitted in S7.4. A motorcycle shall be deemed to comply

## APPENDIX B....Continued

with S5.2, S5.3 and S5.5 if at least one of the stops specified in S7.3, S7.5 and S7.8 is made within the stopping distances specified in Table 1.

## APPENDIX B....Continued

### S7.1 Braking Warming

If the initial brake temperature for the first stop in a test procedure (other than S7.10) has not been reached, heat the brakes to the initial brake temperature by making up to 10 stops from 30 mph at a deceleration of not more than 10 fpsps. On independently operated brake systems, the coldest brake shall be within 10EF of the hottest brake.

### S7.2 Pretest Instrumentation Check

Conduct a general check of test instrumentation by making not more than 10 stops from a speed of not more than 30 mph at a deceleration of not more than 10 fpsps. If test instrument repair, replacement, or adjustment is necessary, make not more than 10 additional stops after such repair, replacement or adjustment.

### S7.3 Service Brake System — First (Preburnished) Effectiveness Test

#### S7.3.1 Service Brake System

Make 6 stops from 30 mph and then 6 stops from 60 mph with an initial brake temperature between 130EF and 150EF.

#### S7.3.2 Partial Service Brake System

For a motorcycle with two independently actuated service brake systems, repeat S7.3.1 using each service brake system individually.

### S7.4 Service Brake System — Burnish Procedure

Burnish the brakes by making 200 stops from 30 mph at 12 fpsps. The braking interval shall be either the distance necessary to reduce the initial brake temperature to between 130EF and 150EF or 1 mile, whichever occurs first. Accelerate at maximum rate to 30 mph immediately after each stop and maintain that speed until making the next stop. After burnishing adjust the brakes in accordance with the manufacturer's recommendation.

## S7.5 Service Brake System — Second Effectiveness Test

Repeat S7.3.1. Then, make 4 stops from 80 mph and 4 stops from the multiple of 5 mph that is 4 mph to 8 mph less than the speed attainable in 1 mile if that speed is 95 mph or greater.

**APPENDIX B....Continued****S7.6 Service Brake System — Fade And Recovery Test**

These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

**S7.6.1 Baseline Check Stops**

Make 3 stops from 30 mph at 10 to 11 fpsps for each stop. Compute the average of the maximum brake pedal forces and the maximum brake lever forces required for the 3 stops.

**S7.6.2 Fade Stops**

Make 10 stops from 60 mph at not less than 15 fpsps for each stop. The initial brake temperature before the first brake application shall be between 130EF and 150EF. Initial brake temperatures before brake applications for subsequent stops shall be those occurring at the distance intervals. Attain the required deceleration as quickly as possible and maintain at least this rate for not less than 3/4 of the total stopping distance for each stop. The interval between the starts of service brake applications shall be 0.4 mile. Drive 1 mile at 30 mph after the last fade stop and immediately conduct the recovery test specified in S7.6.3.

**S7.6.3 Recovery Test**

Make 5 stops from 30 mph at 10 to 11 fpsps for each stop. The braking interval shall not be more than 1 mile. Immediately after each stop accelerate at maximum rate to 30 mph and maintain that speed until making the next stop.

**S7.7 Service Brake System — Reburnish**

Repeat S7.4 except make 35 burnish stops instead of 200 stops. Brakes may be adjusted after reburnish if no tools are used. These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

**S7.8 Service Brake System — Final Effectiveness Test**

These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

## APPENDIX B....Continued

### S7.8.1 Service Brake System

Repeat S7.5 including S7.3.1.

### S7.8.2 Partial Service Brake System Test

Alter the service brake system on three-wheeled motorcycles to induce a complete loss of braking in any one subsystem. Determine the line pressure or pedal force necessary to cause the brake system failure indicator to operate. Make 6 stops from 30 mph and then 6 stops from 60 mph with an initial brake temperature between 130EF and 150EF. Repeat for each subsystem. Determine that the brake failure indicator is operating when the master cylinder fluid level is less than the level specified in S5.1.3.1(a)(2), and that it complies with S5.1.3.1(c). Check for proper operation with each reservoir in turn at a low level. Restore the service brake system to normal at completion of this test.

### S7.9 Parking Brake Test

Starting with an initial brake temperature of not more than 150EF drive the motorcycle downhill on the 30 percent grade with the longitudinal axis of the motorcycle in the direction of the grade. Apply the service brakes with a force not exceeding 90 pounds to stop the motorcycle and place the transmission in neutral. Apply the parking brake by exerting a force not exceeding those specified in S5.6 Release the service brake and allow the motorcycle to remain at rest (to the limit of traction of the braked wheels) for 5 minutes. Repeat the test with the motorcycle parked in the reverse (uphill) position on the grade.

### S7.10 Service Brake System — Water Recovery Test

#### S7.10.1 Baseline Check Stops

Make 3 stops from 30 mph at 10 to 11 fpsps for each stop. Compute the average of the maximum brake pedal forces and of the maximum brake lever forces required for the 3 stops.

#### S7.10.2 Wet Brake Recovery Stops

Completely immerse the rear brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Next completely immerse the front brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Perform the entire wetting procedure in not more than 7 minutes. Immediately after removal of the front brake from water,



**APPENDIX B....Continued**

accelerate at a maximum rate of 30 mph without a brake application. Immediately upon reaching that speed make five stops, each from 30 mph at 10 to 11 fpsps for each stop. After each stop (except the last) accelerate the motorcycle immediately at a maximum rate to 30 mph and begin the next stop.

**S7.11 Final Inspection**

Upon completion of all the tests inspect the brake system in an assembled condition, for compliance with the brake lining inspection requirements. Disassemble all brakes and inspect:

- (a) The entire brake system for detachment or fracture of any component;
- (b) Brake linings for detachment from the shoe or pad;
- (c) Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage;
- (d) Master cylinder for reservoir capacity and retention device; and
- (e) Master cylinder label for compliance with S5.1.2.2.